

Interactive comment on “Ion’s association in soil and vadose zone of Azov-Black sea region” by A. A. Batukaev et al.

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Received and published: 17 February 2016

On behalf of my co-authors, thanks a lot for your positive and constructive comments and suggestions on our manuscript. The authors proposed the new opportunities for quantitative characterization the mass transfer of substances, in particular the transfer of carbon compounds – an essential element of the biosphere. It should be emphasized that proposed approach can be productively extrapolated to the inaccessible by direct analytical measurements scope of highly concentrated solutions, migrating in the soil and the vadose zone.

Disadvantages: 1. The authors haven’t shown convincingly enough to what extend the method of modeling is adequate to the range of high concentrations of soil and saturation zone water solution. This is important because, at the moment, such solution

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is not available to direct analytical determination due to the impossibility of solution's extraction from dispersed system without disrupting their structures and linkages with soil solid and gaseous systems in situ.

Answer. We agree with the reviewer that modern analytical possibilities for studying the soil and saturation zone solutions at high concentrations are limited. To mention it, in the section "discussion" of the final version of the paper after the first paragraph we add the following text:

At high ionic strength of soil solution the biological processes in plant are extremely slow. In this respect the modeling at soil solution ionic strength of more than 1.0 is excessive. But this circumstance is significant for soil, less saline than the one shown in Table 1, as a solution of medium salinity in soil or aeration zone has an ionic strength of about 1.0 at low soil moisture. But now, such solutions are not available to direct analytical determination because of impossibility of its removal from dispersed system without disturbing the structure and linkages with the solid and gas soil systems.

2. The authors note that their model is efficient in a range of ionic strength of from 0.05 to 0.5, but do not justify enough both, the specified range, and the approach to its destination.

Answer. We agree with the reviewer that model performance range should be justified in more details. Accordingly to review comments, in the section "Discussion" final version of the paper after an additional paragraph in the remarks lighting 2, we add the following text:

A range of estimated ionic strength from 0.05 to 1.2 corresponds to the ideas of concentrated solutions and activity of ions by (Debye and Hückel, 1923; Bjerrum et al, 1958; Garrels and Christ, 1965; Sposito, 1984). At higher ionic strength, the soil biological processes, plant growth are extremely difficult, so modeling of solution ionic strength of higher than 1.0 in respect of soil is excessive.

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